3-27-2015

Educational Policies Committee Program Proposal, College of Agriculture and Applied Sciences, March 27, 2015 - Land, Plant & Climate Systems

Utah State University

Institution Submitting Request: Utah State University
Proposed Title: Land, Plant & Climate Systems
Currently Approved Title: Environmental Soil / Water Sciences
School or Division or Location: College of Agriculture and Applied Sciences
Department(s) or Area(s) Location: Department of Plants, Soils and Climate
Recommended Classification of Instructional Programs (CIP) Code[5] (for new programs):
Current Classification of Instructional Programs (CIP) Code (for existing programs): 01.1299
Proposed Beginning Date (for new programs): 08/31/2015
Institutional Board of Trustees' Approval Date: 01/09/2015

Proposal Type (check all that apply):

Regents' General Consent Calendar Items		
R401-5 OCHE Review and Recommendation; Approval on General Consent		
SECTION NO.		**ITEM**
5.1.1	☐	Minor*
5.1.2	☐	Emphasis*
5.2.1	☐	Certificate of Proficiency*
5.2.3	☐	Graduate Certificate*
5.4.1	☐	New Administrative Unit
	☐	Administrative Unit Transfer
	☐	Administrative Unit Restructure
	☐	Administrative Unit Consolidation
5.4.2	☐	New Center
	☐	New Institute
	☐	New Bureau
5.5.1	☐	Out-of-Service Area Delivery of Programs
5.5.2	☐	Program Transfer
	☒	Program Restructure
	☐	Program Consolidation
5.5.3	☒	Name Change of Existing Programs
5.5.4	☐	Program Discontinuation
	☐	Program Suspension
5.5.5	☐	Reinstatement of Previously Suspended Program
	☐	Reinstatement of Previously Suspended Administrative Unit

*Requires "Section V: Program Curriculum" of Abbreviated Template

Chief Academic Officer (or Designee) Signature:
I certify that all required institutional approvals have been obtained prior to submitting this request to the Office of the
Commissioner.

Signature **Date:** 02/18/2015

Printed Name: Laurens H. Smith, Jr.
Executive Senior Vice Provost

Proposal for a Restructuring and Name Change of Environmental Soil / Water Sciences to the Land, Plant, & Climate Systems Major

SECTION I: Request

This proposal seeks approval for a restructuring and a name change of the major in Environmental Soil / Water Science (ESWS) to Land, Plant & Climate Systems in the Department of Plants, Soils and Climate (PSC). This is a renaming and realignment of curriculum from the current major. The proposed restructured program description and required courses are fully described in Appendix 1.

SECTION II: Need

The world is confronted by complex and connected problems including food insecurity and hunger, accelerating climate change, degradation of arable lands and challenges to the sustainability of ecosystem services. Climate change is projected to have profound effects on ecosystems and human activities including agriculture. The availability of water for communities and agriculture is threatened by water source degradation and over-exploitation. These problems are very complex, but do share the theme of interactions between the physical environment and the biosphere. The emerging issues of food security, climate and environmental change require that we harness academic programs to ensure that PSC students become familiar with the science and objective knowledge underlying these issues. While many elements of the above problems are addressed in the present ESWS curriculum, the current academic structure does not provide readily for the integration of knowledge needed to address these issues for the 21st Century. Furthermore the name of the major does not emphasize the link to climate science and land systems studies that are true advantages of the Plants, Soils and Climate Department. The proposed major of Land, Plant, & Climate Systems (LPCS) will explore the interactions between physical and biological sciences in the framework of promoting sustainable systems. There are currently no similar majors offered in the Utah Higher Education System (UHES). In the US Land Grant University system there are several examples that have similarities. The University of California at Davis in the Department of Land Air and Water Resources has a focus on the integrating themes of climate change, environmental quality, agricultural sustainability, and landscape interfaces and processes (http://lawr.ucdavis.edu/strategic_planning.htm). The University of Minnesota, Department of Soil, Water and Climate offers an undergraduate degree in Environmental Sciences, Policy and Management (http://www.swac.umn.edu/Education/_Undergrad/index.htm). The proposed integrated LPCS major in PSC would be a unique offering while maintaining the specialized disciplinary knowledge offerings of the previous ESWS major through emphases and minors.

A Major for Undergraduates Integrating Climate, Soils and Plants

The Plants, Soils and Climate Department currently offers undergraduate majors in Environmental Soil / Water Sciences, Plant Science and Residential Landscape Design and Construction. No formal major integrates Plants, Soils and Climate and no undergraduate major is available for students with a focus in climate or biometeorology. The department currently offers six minors including: Climate Change and Energy, Crop Biotechnology, Agronomy, Soil Science, Ornamental Horticulture and Horticulture. However, there are several faculty members who are climate scientists with active research and teaching programs and there are students in PSC majors with interest in the area of applied climatology and environmental biophysics. The proposed major would add an emphasis for PSC undergraduate students to receive training in these areas of science. Students interested in Sustainable Food Production will find an emphasis that

considers both plant and animal aspects of agriculture. The number of students advised into a College of Agriculture and Applied Sciences (CAAS) Interdisciplinary Studies major has grown steadily from fewer than five to 24 in the past six years. The CAAS academic advisor who mentors these students estimates that about half are primarily interested in Sustainable Food Production. In addition, the current PSC majors do not adequately address the integration of land, plants and climate nor is there a program that promotes a systems approach to agricultural or environmental sciences. The new program will promote a problem solving approach in teaching through new interdisciplinary courses and training students to become adaptive and flexible in their expertise.

Connections to General Student Population
Courses to be developed will include at least one breadth course in Physical Sciences and will support the current minor offerings. Required courses at the undergraduate level that serve students from natural resources and engineering will be improved through considerations to broaden the student experience.

SECTION III: Institutional Impact

The proposed major in Land, Plant, & Climate Systems will not require additional faculty to initiate. Faculty to teach the courses have been identified and are generally already engaged in area of integrated scholarship. However, future full development of the program will require additional faculty in integrated environmental sciences with expertise in climate and water. Needs for interdisciplinary faculty are dependent upon student numbers. The PSC department already has professional advising for its undergraduates. The departmental faculty and department head have been consulted and are supportive of the restructuring of the major as indicated by the attached documentation.

SECTION IV: Finances

Teaching needs in the area of climate and water sciences will increase as student demand grows. University studies classes with large enrollments will request undergraduate teaching fellows as needed from Office of the Provost. Additional resources will be requested as justified based on enrollment and demand for new courses through the standard departmental, college and university channels.

References
American College & University Presidents Climate Commitment [ACUPCC]
from http://www.presidentsclimatecommitment.org/ Accessed 4/21/14

Appendix 1. Program Description

(This is included as an appendix but can be formatted as **Section V** if required)

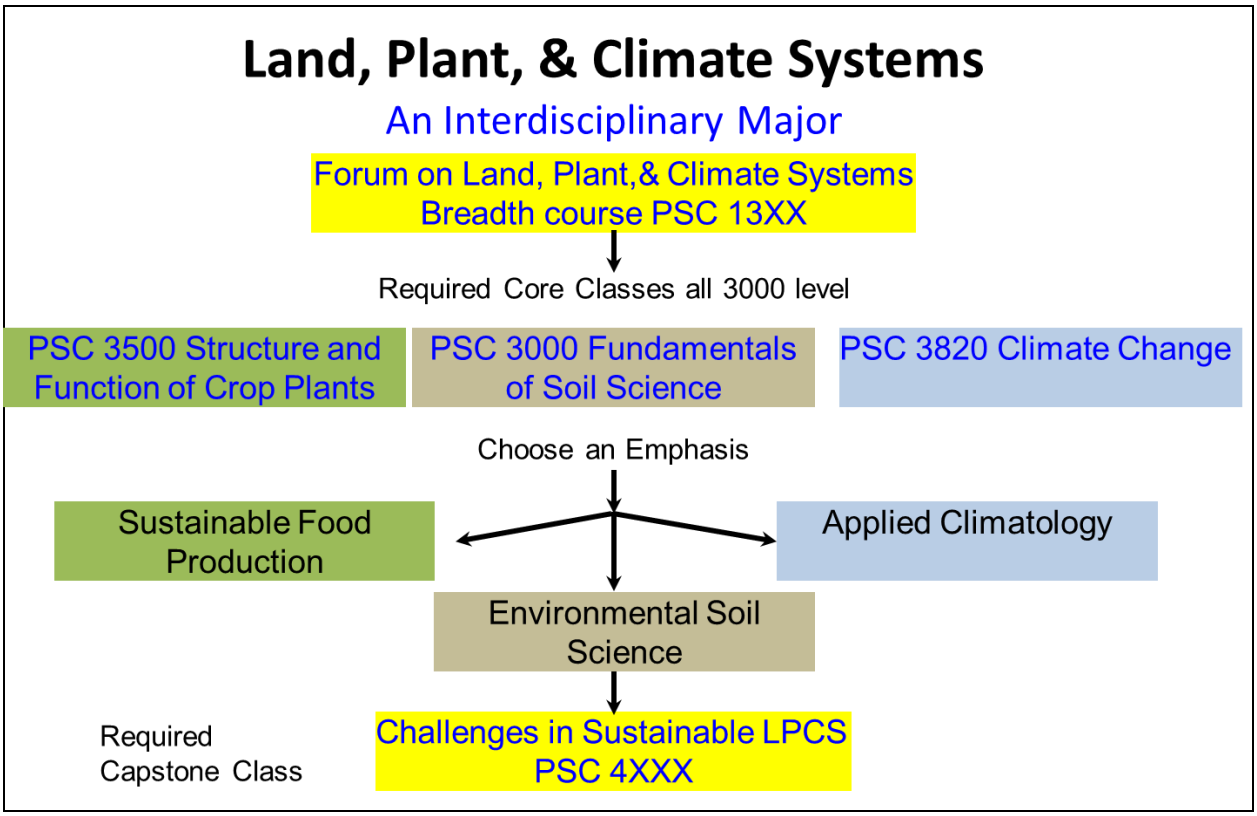

Fig. 1. Overview of LPCS Major

University General Education Requirements

Communications Literacy (6 credits) and Quantitative Literacy (3-4 credits), Math 1050 College algebra (QL) or a MATH course requiring MATH 1050 as a prerequisite is the minimum required for this major (most emphases require additional mathematics). Breadth Requirements include 18 credits at least one course from each of 6 categories. University Studies Depth Education Requirements (two CI, and one QI) and 2 credits in each: Depth Humanities and Creative Arts (DHA) and Depth Social Sciences (DSS).

Major Core Required Courses (15 credits)

The five 5 core classes required of all students to complete the major are described below. The PSC 13XX class will meet one breadth general education physical science requirement for students.

1. **PSC 13XX** Forum on Land, Plant, & Climate Systems **BPS** (3)
2. **PSC 3500** Structure and Function of Crop Plants (3)
3. **PSC 3000** Fundamentals of Soil Science (4)
4. **PSC 3820** Climate Change **DSC/QI** (3)
5. **PSC 4XXX** Challenges in Sustainable Land, Plant, & Climate Systems (Capstone) **CI** (2)

New Courses Proposed, Required for the Major

PSC 13XX Forum on the Land, Plant, & Climate Systems *(BPS)*

Introductory breadth physical science class designed to explore global challenges facing the world and local communities in food security, water availability, land degradation, climate change and agricultural and environmental sustainability. Communication and quantitative skills for assessing these complex issues will be strengthened and form the basis for further work on interactions of water with plants in the terrestrial environment. Water, soils, plants and the atmosphere form a physically integrated, dynamic system in which the various flow processes of energy and matter occur. This is proposed as a new course but may eventually replace the current PSC 2010 Soils, Waters and the Environment (BPS).
3 credits PSC faculty

PSC 4XXX Challenges in Sustainable Land, Plant, & Climate Systems (CI)

Capstone experience for students completing the major. Students integrate socio-economic and sustainability concepts in the analysis of agricultural and environmental problem(s) and present findings in oral and written reports. Students will engage in collaborative research using their knowledge of Land, Plant, & Climate systems. This is proposed as a new course but will eventually replace both the current PSC 4820 Challenges in Climate Change and Energy (CI) and PSC 5740 Environmental Quality: Soil and Water.

Prerequisites: PSC 3820 Climate Change; PSC 3000 Fundamentals of Soil Science, PSC 3500 Structure and Function of Plants
2 credits, PSC faculty

Subtotal = 5 credit hours

Emphasis Required Courses
Select One Emphasis and complete emphasis requirements

Sustainable Food Production
Environmental Soil Science
Applied Climatology

Total = 120-124 credit hours

Courses and Requirements listed in each emphasis include the courses required for the LPCS major for completeness.

Sustainable Food Production

Addressing the challenges in the search for sustainable food production requires a diverse understanding of agriculture and the environment. The goal of sustainable agriculture is to support integrated systems of plant and animal production practices that will, over the long term: satisfy human food and fiber needs; enhance environmental quality and the natural resource base, make the most efficient use of nonrenewable resources and on-farm resources, sustain economic viability of agriculture; and enhance the quality of life for farmers, farm workers and society as a whole. The number of students advised into a College of Agriculture and Applied Sciences (CAAS) Interdisciplinary Studies major has grown steadily from fewer than five to 24 in the past six years. The CAAS academic advisor who mentors these students estimates that about half are primarily interested in Sustainable Food Production. Students in the Sustainable Food Production emphasis will gain a strong foundation in science and develop an individualized curriculum inclusive of animal and crop production as well as the economic and sociological implications of agricultural production. Specific courses will be selected across disciplines within CAAS and tailored to meet each student's interests and goals. The Sustainable Food Production emphasis will include a farm practicum as well as the Land, Plant, & Climate Systems capstone course to provide both farming experience and real-world, interdependent problem-solving experience. This emphasis will provide students with an understanding of the interdisciplinary nature of farming systems by emphasizing the ecological theory underpinning the design of farming systems for maximal sustainability. Students will gain a firm foundation for a variety of career options such as owning their own farming enterprise or working as a farm manager for a larger conventional or organic operation. Students will have a sufficiently strong foundation in science to undertake graduate work in agroecology, and they will also be prepared for further study in agricultural business, outreach or policy.

Emphasis in Sustainable Food Production

General Education Requirements (37 credits)	
ENGL 1010 (**CL**) Introduction to Writing (or test)	**3**
ENGL 2010 (**CL**) Intermediate Writing	**3**
ASTE 2900 (**BSS**) Humanity in the Food Web	**3**
WILD 2200 (**BLS**) Ecology of Our Changing World	**3**
APEC 3010 (**DSS**) Intro.to Agricultural Economics and Agribusiness	**3**
HIST 3950 (**DHA**; **CI**) Environmental History	**3**
MATH 1050 (**QL**) College Algebra	**4**
PHIL 1120 (**BHU**) Social Ethics	**3**
PSC 13XX (**BPS**) Forum on the Land, Plant, & Climate Systems	**3**
USU 1300 (**BAI**) US Institutions	**3**
USU 1330 (**BCA**) Civilization: Creative Arts	**3**
ASTE 5260 (**CI**) Environ. Impacts of Agric. Systems	**3**
(**QI**) * see below	
Required Preparatory and Professional Core Courses (50-53 credits)	
BIOL 1610 (**BLS**) Biology I	**4**
BIOL 1620 (**BLS**) Biology II	**4**
CHEM 1110 (**BPS**) General Chemistry I	**4**
CHEM 1115 (**BPS**) General Chemistry I Lab	**1**
GEO 3150 (**DSC/QI**) Energy in the 21st Century	**3**
PSC 2800 Fundamentals of Organic Agriculture	**3**
PSC 3000 Fundamentals of Soil Science	**4**

PSC 3500 Structure and Function of Plants	**3**
PSC 3600 Introduction to Plant Breeding and Heredity	**2**
PSC 3820 Climate Change (**DSC/QI**)	**3**
BIOL 4430 Introduction to Plant Pathology	**4**
BIOL 4500 Applied Entomology	**3**
PSC 5550 Weed Biology and Control	**3**
PSC 4900 Organic Farm Practicum **and/or**	
PSC 4250 Internship in Plants, Soils and/or Climate. **1-4**	
PSC 5530 (**QI**) Soils and Plant Nutrient Bioavailability	**3**
PSC 5XXX Advanced Agroecology	**3**
PSC 4XXX (**CI**) Challenges in Sustainable LPCS	**2**
Agricultural Coursework	
Select at least 18 credits from the following):	
ADVS 1100 Small-Scale Animal Production	**3**
ADVS 5030 Sustainable Agricultural Production Systems w/ Animals	**3**
ASTE 1130 Planting and Tillage Equipment	**3**
ASTE 3080 Compact Power Units for Agric. and Turfgrass Apps.	**3**
PSC 3420 (**QI**) Landscape Irrigation Design	**2**
PSC 4000 Soil and Water Conservation	**4**
PSC 4050 Greenhouse Management and Crop Production	**4**
PSC 4280 Field Crops	**3**
PSC 4320 Forage Production and Pasture Ecology	**3**
PSC 4400 Modern Vegetable Production	**3**
PSC 4200 Temperate Zone Fruit Production	**3**
PSC 4700 Irrigated Soils	**3**
WILD 4000 Rangeland Management	**3**
WILD 4500 Conservation Biology	**3**
Human Systems Coursework	
Select at least 12 credits from the following:	
ENVS 2340 (**BSS**) Natural Resources and Society	**3**
ENVS 3330 Environment and Society	**3**
ENVS 4700 Communicating Sustainability	**3**
ENVS 5550 Sustainability: Concepts and Measurement	**3**
LAEP 2039 Foundations of Sustainability	**3**
MGT 2350 Small Business Management	**3**
MGT 3500 Fundamentals of Marketing	**3**
MIS 5700 (**DSS**) Internet Mngt. & Electronic Commerce	**3**
NDFS 1260 Food Literacy	**3**
PHIL 3510 Environmental Ethics	**3**
SOC 3610 (**DSS**) Rural Sociology	**3**
SOC 4620 (**DSS**) Sociology of the Environment and Natural Res.	**3**
SOC/ENVS 5640/6640(**CI**) Conflict Management in Natural Res.	**3**
WATS 1200 (**BLS**) Biodiversity and Sustainability	**3**
Total Required 117-120 (minimum 120 required for BS degree)	

Land Plant Climate Systems —Sustainable Food Production Emphasis, Four Year Plan (Suggested Schedule)

Please meet with your advisor to complete your specific four year plan.

Freshman Year (30 credits)

First Semester (15 credits)

- ENGL 1010 Introduction to Writing (CL) **3**
- MATH 1050 College Algebra (QL) **4**
- CHEM 1110 General Chemistry I (BPS) **4**
- CHEM 1115 General Chemistry Laboratory I (BPS) **1**
- PSC 13XX- Forum on Land-Plant-Climate Systems (BPS) **3**

Second Semester (15 credits)

- PHIL 1120 Social Ethics (BHU) **3**
- USU 1300 US Institutions (BAI) **3**
- USU 1330 Civilization: Creative Arts (BCA) **3**
- ENGL 2010 Intermediate Writing (CL) **3**
- ASTE 2900 Food Matters: Ethics, Economics, and the Environment (BSS) **3**

Sophomore Year (31 credits)

First Semester (15 credits)

- BIOL 1610 Biology I **4**
- WILD 2200 Ecology of Our Changing World (BLS) **3**
- PSC 3000 Fundamentals of Soil Science **4**
- ASTE 5260 Environmental Impacts of Agricultural Systems (CI) **3**

Second Semester (16 credits)

- BIOL 1620 Biology II (BLS) **4**
- PSC 2800 Fund of Organic Agriculture **3**
- APEC 3010 Introduction to Agricultural Economics and Agribusiness (DSS) **3**
- GEO 3150 Energy in the 21st Century (DSC/QI) **3**
- PSC 3500 Structure and Function of Plants **3**

Junior Year (30-32 credits)

First Semester (15-17 credits)

- PSC 3820 Climate Change (DSC/QI) **3**
- HIST 3950 Environmental History (DHA; CI) **3**
- PSC 4000 Soil and Water Conservation **4**
- PSC 5550 Weed Biology and Control **4**
- PSC 4900 Organic Farm Practicum and/or
  PSC 4250 Internships in PSC **1-3**

Second Semester (15 credits)

- ADVS 1100 Small-Scale Animal Production **3**
- PSC 3600 An Introduction to Plant Breeding and Heredity **2**
- BIOL 4430 Introduction to Plant Pathology **4**
- BIOL 4500 Applied Entomology **3**
- PSC 5530 Soils and Plant Nutrient Bioavailability (QI) **3**

Senior Year (30 credits)

First Semester (15 credits)

- LAEP 2039 Foundations of Sustainability **3**
- MGT 3500 Fundamentals of Marketing **3**
- PSC 4400 Modern Vegetable Production **3**
- ADVS 5030 Sustainable Agricultural Production Systems with Animals **3**
- MIS 5700 Internet Management and Electronic Commerce (DSS) **3**

Second Semester (15 credits)

- ASTE 3080 Compact Power Units for Agricultural Applications **3**
- PSC 4050 Greenhouse Mgt & Crop Prod **4**
- PSC 4200 Temperate Zone Fruit Production **3**
- PSC 5XXX Advanced Agroecology **3**
- PSC 4XXX Challenges in Sustainable LPCS (CI) **2**

Total Credits 121-123

Minimum University Requirements

Total Credits	120
Grade Point Average (most majors require higher GPA)	2.00 GPA
Credits of C- or better	100
Credits of upper-division courses (#3000 or above)	40

Completion of approved major program of study	See college advisor
Credits in minor (if required)	12
Credits in American Institutions (ECN 1500;HIST 1700, HIST 2700 or HIST 2710;HONR 1300; POLS 1100; or USU 1300)	3
General Education Requirements and University Studies Depth Requirements	

Environmental Soil Sciences

This emphasis prepares students for careers or advanced study in the environmental and soil sciences and the management of land and water resources. Students gain fundamental understanding of the basic sciences and mathematics, as well as a strong background in soil science. Courses emphasize the interactive soil/water processes in terrestrial ecosystems—from the microscopic to the landscape perspective. From this base, each student can design his or her own program of specialization. Graduates are prepared for a variety of career opportunities in the public and private sectors, or to advance their educations in competitive graduate programs.

Emphasis in Environmental Soil Science

General Education Requirements (**32 credits**)

(**CL1**) ENGL 1010 Introduction to Writing (or test)	**3**
(**CL2**) ENGL 2010 Intermediate Writing	**3**
(**QL**) (see Mathematics requirement)	
(**BAI**)	**3**
(**BCA**)	**3**
(**BHU**)	**3**
(**BLS**) WILD 2200 Ecology of Our Changing World*	**3**
(**BPS**) PSC 13XX Forum on the LPCS*	**3**
(BSS) suggest ASTE 2900 Humanity in the Food Web	**3**
(**DHA**) suggest HIST 3950 Environmental History (CI)	**3**
(**DSS**) suggest APEC 3010 Intro. to Ag Econ. or APEC 3012	**3**
(**QI**) see preparatory classes	
(CI) PSC 48XX Challenges in LPCS* and 1 other	**2**

***** These specific courses are required for the LPCS major or the ESS emphasis as well

Required Preparatory Courses (**46-50** credits)

BIOL 1610 Biology I	**4**
GEO 1110 Physical Geology (BPS)	**3**
GEO 1115 Physical Geology Lab	**1**
PSC 3000 Fundamentals of Soil	**4**
PSC 3500 Structure and Function of Plants	**3**
PSC 3820 Climate Change (**DSC/QI**)	**3**

Complete *one* of the two following blocks of Chemistry courses (9 or 10):

Block 1 (9 credits)

CHEM 1110 General Chemistry I (BPS)	**4**
CHEM 1120 General Chemistry II (BPS)	**4**
CHEM 1125 General Chemistry II Laboratory	**1**

or

Block 2 (10 credits)

CHEM 1210 Principles of Chemistry I	**4**
CHEM 1215 Chemical Principles Laboratory I	**1**
CHEM 1220 Principles of Chemistry II (BPS)	**4**
CHEM 1225 Chemical Principles Laboratory II	**1**

Complete *one* of the two following blocks of Mathematics courses and *one* Statistics Course, also covers Quantitative Literacy (QL) (11-14 credits):

Block 1 (10 credits)	
MATH 1050 College Algebra (QL)	**4**
MATH 1060 Trigonometry	**2**
MATH 1210 Calculus I (QL)	**4**
or	
Block 2 (8 credits)	
MATH 1210 Calculus I (QL)	**4**
MATH 1220 Calculus II (QL)	**4**
STAT 2000 Statistical Methods (QI)	**4**
or	
STAT 3000 Statistics for Scientists (QI)	**3**

Complete *one* of the two following blocks of Physics courses (8 credits):

Block 1 (8 credits)	
PHYS 2110 General Physics - Life Sciences I	**4**
PHYS 2120 General Physics - Life Sciences II (BPS)	**4**
or	
Block 2 (8 credits)	
PHYS 2210 Physics for Scientists and Engineers I (QI)	**4**
PHYS 2220 Physics for Scientists and Engineers II (BPS/QI)	**4**

Required Professional Core (17 credits)

PSC 5050 Principles of Environmental Soil Chemistry	**3**
PSC 5130 Soil Genesis, Morphology, and Classification	**4**
PSC 5670 Environmental Soil Physics	**4**
PSC 5560 Analytical Techniques for the Soil Environment	**3**
PSC 5310 Soil Microbiology	**3**
or	
PSC 5530 Soils and Plant Nutrient Bioavailability (QI)	**3**

Further Discipline Related Courses (15 credits)

Select 15 credits from this list of PSC, ASTE, GEO, WATS, WILD courses with advisor

PSC 2800 Fundamentals of Organic Agriculture	**3**
PSC 3400 Arboriculture	**3**
PSC 3600 Introduction to Plant Breeding and Heredity	**2**
PSC 3810 Turfgrass Management	**3**
PSC 4000 Soil and Water Conservation	**4**

PSC 4200 Temperate Zone Fruit Production	**3**
PSC 4280 Field Crops	**3**
PSC 4320 Forage Production and Pasture Ecology	**3**
PSC 4400 Modern Vegetable Production	**3**
PSC 4500 Soil Reclamation	**3**
PSC 4700 Irrigated Soils	**3**
PSC 5100 Prof. Turf and Urban Landscape Water Management	**3**
PSC 5200 Site Specific Agric. and Landscape/Hort. Management	**3**
PSC 5270 Environmental Plant Physiology	**2**
PSC/BIOL 5310 Soil Microbiology	**3**
PSC/WILD 5350 Wildland Soils	**3**
PSC 5400 General Meteorology	**3**
PSC 5430 Plant Nutrition	**2**
PSC 5500 Environmental Physics of Land Ecosystems and Climate	**3**
PSC 5530 Soils and Plant Nutrient Bioavailability (QI)	**3**
PSC 5550 Weed Biology and Control	**4**
PSC/CEE/WATS 5003 Remote Sensing of Land Surfaces	**3**
ASTE 5260 Environmental Impacts of Agricultural Systems (CI)	**3**
BIOL 4430 Introduction to Plant Pathology	**4**
BIOL 4500 Applied Entomology	**3**
CEE 3430 Engineering Hydrology	**3**
CEE 5000 Irrigation and Drainage of Agricultural Lands	**3**
CEE 5190 Geographic Information Systems for Civil Engineers	**3**
CHEM 3000 Quantitative Analysis (QI)	**3**
GEO 3500 Minerals and Rocks	**4**
GEO 3150 Energy in the 21st Century (DSC/QI) **3**	
GEO 3550 Sedimentation and Stratigraphy (CI)	**4**
GEO/WATS 3600 Geomorphology	**4**
GEO 5510 Groundwater Geology (QI)	**3**
GEO 5520 Techniques of Groundwater Investigations (CI)	**3**
GEO 5600 Geochemistry	**3**
GEO 5630 Geologic Image Analysis	**3**
GEO/WATS 5150 Fluvial Geomorphology	**3 or 4**
GEO 5680 Paleoclimatology	**3**
WATS 3700 Fundamentals of Watershed Science (CI)	**3**
WATS 4500 Limnology: Ecology of Inland Waters	**3**
WATS 4530 Water Quality and Pollution	**3**
WATS 4930 Advanced GIS and Spatial Analysis	**3**
WATS 5640 Riparian Ecology and Management	**3**
WILD 3600 Wildland Plant Ecology and Identification	**4**
WILD 4750 Monitoring and Assessment in Natural Resource and Environmental Management	**3**
WILD 4910 Assessment and Synthesis in Nat. Resource Science	**3**
WILD 5750 Applied Remote Sensing	**3**

Total required 110-114 (minimum 120 required for BS degree)

Land Plant Climate Systems —Environmental Soil Science Emphasis, Four Year Plan (Suggested Schedule)

Please meet with your advisor to complete your specific four year plan.

Freshman Year (31 credits)

First Semester (16 credits)

- CHEM 1110 General Chemistry I **4**
- USU 1010 University Connections **2**
- Math 1210 Calculus I **4**
- ENGL 1010 Introduction to Writing (CL1) **3**
- PSC 13XX Forum on Land, Plant, Climate Systems (BPS) **3**

Second Semester (15 credits)

- CHEM 1120 General Chemistry II (BPS) **4**
- CHEM 1125 General Chemistry II Laboratory **1**
- Math 1220 Calculus II **4**
- ENGL 2010 Intermediate Writing (CL2) **3**
- USU 1300 U.S. Institution or other (BAI) **3**

Sophomore Year (30 credits)

First Semester (15 credits)

- ASTE 2900- Humanity in the Food Web (BSS) **3**
- BIOL 1610 - Biology I **4**
- GEO 1110 Physical Geology **3**
- GEO 1115 Physical Geology **1**
- PSC 3000 Fundamentals of Soil Science **4**

Second Semester (15 credits)

- PSC 3820 Climate and Climate Change (DPS) (QI) **3**
- WILD 2200 Ecology of Our Changing World (BLS) **3**
- PSC 3500 Structure and Function of Crop Plants **3**
- HIST 3950 Environmental History (DHA) (CI) **3**
- USU 1330 Civilization: Creative Arts (BCA) **3**

Junior Year (30-32 credits)

First Semester (15-17 credits)

- PHYS 2210 Physics for Scientists **4**
- STAT 3000 Statistics for Scientists **3**
- PSC 5130 Soil Genesis, Morphology, and Classification **4**
- APEC 3012 Intro to Natural Resource and Regional Economics (DSS) **3**
- Elective **1-3**

Second Semester (15 credits)

- PHYS 2220 Physics for Scientists II **4**
- PSC 5530 Soils and Plant Nutrient Bioavailability **3**
- PSC 5560 Analytical Techniques for the Soil Environment **3**
- PSC 5050 Principles of Environmental Soil Chemistry **3**
- PSC 5270 Environmental Plant Physiology (Discipline Elective) **2**

Senior Year (29-30 credits)

First Semester (15 credits)

- PSC 4000 Soil and Water Conservation (Discipline Elective) **4**
- PSC 5670 Environmental Soil Physics **4**
- Discipline Electives **7**

Second Semester (14-15 credits)

- PSC 48XX Challenges in LPCS (CI) **2**
- Discipline elective **3**
- Electives or requirements **9 -10**

Total 120-124 credits

Minimum University Requirements

Total Credits 120
Grade Point Average (most majors require higher GPA) 2.00 GPA
Credits of C- or better 100
Credits of upper-division courses (#3000 or above) 40

Completion of approved major program of study See college advisor
Credits in minor (if required) 12
Credits in American Institutions (ECN 1500; HIST 1700, HIST 2700 or HIST 2710; HONR 1300; POLS 1100; or USU 1300) 3
General Education Requirements and University Studies Depth Requirements

Applied Climatology

The program integrates basic and applied principles of meteorology, climatology and environmental physics with land surface processes, especially water. A sound background in math, physics and the basis of physical science is utilized to examine the biophysical interactions between land ecosystems and climate at various scales. This includes learning about instrumentation and measurements of the atmosphere, soil, water and plants in the field, and how the data are used to address practical issues related to climate, water and energy. The graduates would be well prepared to pursue graduate education in atmospheric science, climatology, hydrology and most other physical sciences, but especially suited for interdisciplinary science programs. They would also be suited to work with private consulting firms to address practical problems related to issues such as climate, weather, energy and water use. Finally, they will immediately be well prepared for positions as research technicians in federal, state and university laboratories.

Emphasis in Applied Climatology

General Education Requirements (32 credits)

(**CL1**) ENGL 1010 Introduction to Writing (or test)	**3**
(**CL2**) ENGL 2010 Intermediate Writing	**3**
(**QL**) see preparatory courses	
(**BAI**)	**3**
(**BCA**)	**3**
(**BHU**)	**3**
(**BLS**) WILD 2200 Ecology of Our Changing World*	**3**
(**BPS**) PSC 13XX Forum on the LPCS*	**3**
(BSS) suggest ASTE 2900 Humanity in the Food Web	**3**
(**DHA**) suggest HIST 3950 Environmental History (CI)	**3**
(**DSS**)	**3**
(**QI**) see preparatory courses	
(CI) PSC 48XX Challenges in LPCS* and 1 other	**2**

***** These specific courses are required for the LPCS major or the AC emphasis as well

Required Preparatory Courses (48 credits)

BIOL 1610 Biology I	**4**
MATH 1210 Calculus I	**4**
MATH 1220 Calculus II	**4**
MATH 2250 Linear Algebra and Differential Equations	**4**
STAT 3000 Statistics for Scientists	**3**
PHYS 2210 Physics for Scientists & Engineers I	**4**
PHYS 2220 Physics for Scientists & Engineers II	**4**
CHEM 1210 Principles of Chemistry	**4**
GEO 1110 Physical Geology	**3**
GEO 1115 Physical Geology Lab	**1**
PSC 2000 Atmosphere and Weather	**3**
PSC 3000 Fundamentals of Soil Science	**4**
PSC 3820 Climate Change	**3**
PSC 3500 Structure and Function of Plants	**3**

Required Professional Core (26 credits)

GEO 3150 Energy in the 21st Century	**3**
PSC 5000 Environmental Instrumentation	**2**
PSC 5270 Environmental Plant Physiology	**2**
PSC 5670 Environmental Soil Physics	**4**
PSC 5500 Land-Atmosphere Interactions	**2**
PSC 5300 Remote Sensing of Land Surfaces	**4**
PSC 5400 General Meteorology	**3**
GEO 5680 Paleoclimatology	**3**
PSC 6900 Special Problems Climate Data Analysis	**3**

Further Discipline Courses (choose 12 credits)

Select 12 credits from this list of supporting courses

CEE 3430 Engineering Hydrology	**3**
GEO 1110 Physical Geology and Geo 1115 Laboratory	**4**
GEO 3200 Earth through Time (QI/DSC)	**3**
GEO 5440 Paleoecology (CI)	**2**
GEO 3100 Natural Disasters (DSC)	**3**
GEO 3600 Geomorphology	**4**
JCOM 1130 Beginning Newswriting for the Mass Media	**3**
ENVS 5750 Sustainable Living	**3**
ECON 5560 Natural resources and environmental economics	**3**
PSC 4200* Global and Regional Climatology	**2**
WILD/BIOL/SOIL 6200 Biogeochem of Terrestrial Ecosys	**3**

*Possible New Classes to Be Created

Total required 118 (minimum 120 required for BS degree)

Some suggested courses to fulfill General Studies Requirements

ASTE 5260 (CI) Environ. Impacts of Agric. Systems	**3**
ASTE 2900 (BSS) Humanity in the Food Web	**3**
ENGL 1010 (CL) Introduction to Writing	**3**
ENGL 2010 (CL) Intermediate Writing	**3**
HIST 3950 (DHA; CI) Environmental History	**3**
JCOM 1510 (BSS) Introduction to Mass Communication	**3**
PHIL 4310 (DHA) Philosophy of Science	**3**
PHIL 3510 (DHA) - Environmental Ethics	**3**
POLS 3810 (DSS) Introduction to Public Policy	**3**
USU 1300 (BAI) US Institutions	**3**
USU 1330 (BCA) Civilization: Creative Arts	**3**
WILD 2200 (BLS) Ecology of Our Changing World	**3**

Land Plant Climate Systems —Applied Climatology Emphasis, Four Year Plan (Suggested Schedule)

Please meet with your advisor to complete your specific four year plan.

Freshman Year (31 credits)

First Semester (16 credits)

- PSC 2000 Atmosphere and Weather **3**
- Math 1210 Calculus I **4**
- ENGL 1010 Introduction to Writing (CL1) **3**
- PSC 13XX Forum on Land, Plant, Climate Systems (BPS) **3**
- USU 1300 U.S. Institution or other (BAI) **3**

Second Semester (15 credits)

- CHEM 1210 Principles of Chemistry I **4**
- GEO 1110 Physical Geology **3**
- GEO 1115 Physical Geology **1**
- Math 1220 Calculus II **4**
- ENGL 2010 Intermediate Writing (CL2) **3**

Sophomore Year (30 credits)

First Semester (15 credits)

- BIOL 1610 Biology I **4**
- USU 1330 Civilization: Creative Arts (BCA) **3**
- PHYS 2210 Physics for Scientists **4**
- Math 2250 Linear Algebra & Differential Equations **4**

Second Semester (15 credits)

- PSC 3820 Climate and Climate Change (DPS) (QI) **3**
- CS 1400 Introduction to Computer Science **3**
- CS 1405 Introduction to Computer Science Lab **1**
- WATS 3000 Oceanography **3**
- PHYS 2220 Physics for Scientists II **4**
- Electives **1**

Junior Year (31 credits)

First Semester (16 credits)

- STAT 3000 Statistics for Scientists **3**
- WILD 2200 Ecology of Our Changing World (BLS) **3**
- PSC 3000 Fundamentals of Soil Science **4**
- PSC 35400 General Meteorology **3**
- ASTE 2900- Humanity in the Food Web (BSS) **3**

Second Semester (15 credits)

- APEC 3012 Intro to Natural Resource and Regional Economics (DSS) **4**
- PSC 3500 Structure and Function of Crop Plants **3**
- GEO 56800 Paleoclimatology **3**
- CEE 3430 Engineering Hydrology 3
- PSC 5270 Environmental Plant Physiology **2**

Senior Year (30 credits)

First Semester (15 credits)

- HIST 3950 Environmental History (DHA) (CI) **3**
- PSC 5670 Environmental Soil Physics **4**
- PSC 5003 Remote Sensing Land Surface **4**
- Discipline Electives (Advanced Meteorology) **4**

Second Semester (15 credits)

- PSC 5000 Environmental Instrumentation **3**
- PSC 48XX Challenges in LPCS (CI) **2**
- GEO 3150 Energy in the 21st Century **2**
- PSC 5500 Land-Atmosphere Interactions **3**
- Electives or requirements **5**

Total 122 credits

Minimum University Requirements

Total Credits 120
Grade Point Average (most majors require higher GPA) 2.00 GPA

Credits of C- or better 100
Credits of upper-division courses (#3000 or above) 40

Completion of approved major program of study See college advisor
Credits in minor (if required) 12
Credits in American Institutions (ECN 1500; HIST 1700, HIST 2700 or HIST 2710; HONR 1300; POLS 1100; or USU 1300) 3
General Education Requirements and University Studies Depth Requirements